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Statistical Applications on Greek Crime Counts

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DEDICATION

A Greek poet named Kavafis says in “Ithaca” that the journey there was more fruitful than the destination itself. He also says that the obstacles that we meet in the journey are only appearing when we are bearing them in our soul. Maybe he is right, who can tell for sure? This journey took quite long and indeed I’ve earned a lot in the middle time. It’s only sad that I’ve lost loving persons, who cannot meet me at the port of my “Ithaca” to welcome me.

I dedicate this thesis to the memory of my father and all those who I am sure they would be glad knowing my ship has secured at last.

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Last but not least, I owe many thanks to all those who believed in me, supporting me all this time and not letting me give up the efforts, since I have met many obstacles blocking my way. These people would like to be kept unnamed, so I will not name them. I only wish they will keep supporting me through life, wherever they are.

VITA

I was born in Agrinio in 1972. I finished Maraslion Lyceum in Athens, and everyone said I would become a doctor or a Mathematician. I finally graduated from the Department of Mathematics of Athens University. Then, I studied Statistics in the Graduate Program of the Department of Statistics of Athens University of Economics and Business, where I also work until now.

ABSTRACT

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Statistical Applications in Greek Crime Counts

Statistics and criminology have been cooperating for over two centuries. Statistical analyses have led to inferences that helped us understand crime behavior and helped authorities in combating crime.

This work is an effort to briefly present that Statistics can help in forming a more complete picture of crime activity, in order to understand its mechanisms. A short review of statistical applications in criminology is presented.

Since reported crimes to the police are found to follow some kind of Poisson mixture, we present some semiparametric methods of revealing the clusters in such heterogeneous populations based on maximum likelihood estimation.

Available Greek crime data are examined using preliminary methods.

A non parametric maximum likelihood estimation algorithm is applied to reveal the hidden clusters for annual data per available offense.

In the end, clustering of the estimated partial classifications obtained from the application of the NPMLE algorithm using Complete Linkage is performed to create a catholic picture of crime activity in Greece. The results are mapped for a better representation.

ΠΕΡΙΛΗΨΗ

Αλεξάνδρα Α. Τσιαμτσιούρη

Στατιστικές Εφαρμογές σε Ελληνικά Εγκληματολογικά Δεδομένα

Η Στατιστική και η Εγκληματολογία είναι δύο κλάδοι οι οποίοι συνεργάζονται για περισσότερο από δύο αιώνες. Τα εξαγόμενα στατιστικά συμπεράσματα έχουν βοηθήσει τόσο τη κοινωνία να κατανοήσει την εγκληματική συμπεριφορά όσο και τις Αρχές στην καταπολέμηση του εγκλήματος.

Η παρούσα εργασία αποτελεί μια προσπάθεια να παρουσιάσει εν συντομία ότι η Στατιστική μπορεί να βοηθήσει στη δημιουργία μιας πληρέστερης εικόνας της εγκληματικής δραστηριότητας, με σκοπό να κατανοήσουμε τους μηχανισμούς της. Γι' αυτό το λόγο παρουσιάζεται μια σύντομη αναδρομή στατιστικών εφαρμογών στην εγκληματολογία.

Τα αναφερόμενα στις αστυνομικές αρχές αδικήματα έχει αποδειχθεί ότι ακολουθούν κάποια μορφή μίξης της κατανομής Poisson. Εξ αιτίας αυτού, παρουσιάζουμε κάποιες ημιπαραμετρικές μεθόδους ανάδειξης των επιμέρους ομάδων σε τέτοιου είδους ετερογενής πληθυσμούς, οι οποίες βασίζονται στην εκτίμηση της μέγιστης πιθανοφάνειας.

Στη συνέχεια, τα διαθέσιμα Ελληνικά δεδομένα αδικημάτων εξετάζονται χρησιμοποιώντας προκαταρκτικές μεθόδους.

Ένας μη παραμετρικός αλγόριθμος εκτίμησης της μέγιστης πιθανοφάνειας εφαρμόζεται στα διαθέσιμα δεδομένα για να αναδείξει τις υποομάδες των Ελληνικών νομών βάσει των ετήσιων κάθε φορά αναφερόμενων αδικημάτων, για κάθε αδίκημα ξεχωριστά.

Τέλος, γίνεται κατηγοριοποίηση με χρήση της ιεραρχικής μεθόδου 'Complete Linkage' των εκτιμώμενων μερικών ομαδοποιήσεων που έδωσε ο μη παραμετρικός αλγόριθμος εκτίμησης μέγιστης πιθανοφάνειας, ώστε να

δημιουργήσουμε μία καθολική εικόνα της εγκληματικότητας στην Ελλάδα. Τα αποτελέσματα εικονίζονται σε χάρτες για την καλύτερη παρουσίασή τους.

TABLE OF CONTENTS

Chapter 1	1
Introduction	1
Chapter 2	3
Crime and Statistics.....	3
2.1 Attempts of recording crime data in order to cut down crime activity.....	3
2.2 Statistical Applications in Criminology	5
Chapter 3	17
Analysis of Mixtures	17
3.1 Introduction	17
3.2 Basic definitions	18
3.3 Interpretation of mixture models.....	19
3.4 Conventional approaches of classification	21
3.4.1 Mapping percentiles.....	21
3.4.2 Mapping p-values	22
3.4.3 Mapping Empirical Bayes estimates	23
3.5 When the number of subpopulations g is unknown.....	25
3.6 The number of support points	27
3.7 Algorithms for Semiparametric Maximum Likelihood estimation for mixtures	29
3.7.1 The Vertex Direction Method (VDM).....	29
3.7.2 The Vertex Exchange Method (VEM).....	32
3.7.3 The Intra Simplex Direction Method (ISDM).....	33
3.7.4 Related algorithms	34
Chapter 4	37
Presentation of the Available Greek Crime Data	37
4.1 Offenses under consideration.....	37
4.2 Preliminary examination of Greek crime data	40
4.2.1 Annual data	40

4.2.2	Monthly data.....	52
4.3	Principal Components Analysis	61
4.3.1	PCA Analysis of the annual data	62
4.3.2	PCA Analysis of the monthly data.....	67
4.4	Clustering of the offenses according to their behavior through time	73
4.4.1	Annual data	74
4.4.2	Monthly data.....	77
Chapter 5	81
Application of Non Parametric Maximum Likelihood		
Estimation to Greek data.....		81
5.1	Using official crime reports instead of real crime counts.....	81
5.2	Greek Data considerations	86
5.3	Obtained distribution parameters using the NPMLE algorithm	89
5.4	Mapping the results of the NPMLE application.....	89
Chapter 6	91
Classification of the Greek counties using the NPMLE		
application results.....		91
6.1	Clustering of Greek counties per offense activity	92
6.1.1	Taking the law into one's hands	92
6.1.2	Arsons	94
6.1.3	Offenses concerning antiquities.....	95
6.1.4	Caused deaths by car.....	97
6.1.5	Commonly dangerous crimes.....	99
6.1.6	Drug offenses	101
6.1.7	Beggary and vagrancy	103
6.1.8	Offenses concerning explosives.....	104
6.1.9	Arsons in forests	106
6.1.10	Illegal possession and usage of fire guns	108
6.1.11	Homicides by misadventure	110
6.1.12	Smuggling	111
6.1.13	Offenses against life	113

6.1.14 Robbery	114
6.1.15 Murder.....	116
6.1.16 Rape	118
6.1.17 Physical injuries	120
6.2 Annual clustering of Greek counties by all offenses.....	122
6.2.1 Crime volume of 1987.....	122
6.2.2 Crime volume of 1988.....	124
6.2.3 Crime volume of 1989.....	126
6.2.4 Crime volume of 1990.....	128
6.2.5 Crime volume of 1991.....	130
6.2.6 Crime volume of 1992.....	131
6.2.7 Crime volume of 1993.....	133
6.2.8 Crime volume of 1994.....	134
6.2.9 Crime volume of 1995.....	136
6.2.10 Crime volume of 1996.....	138
6.2.11 Crime volume of 1997.....	140
6.3 Final clustering of Greek counties based on the total volume of offenses for the whole time period 1987-1997.....	141
Chapter 7	145
Conclusions	145
APPENDIX A.....	147
Populations of Greek Counties	147
Input File: 87guns.txt.....	149
Output File: 87guns.res	150
APPENDIX B.....	153
Obtained cluster memberships of the Greek counties from the SML estimation	153
BIBLIOGRAPHY	163

LIST OF TABLES

TABLE 1	Variance explained by the four most important components of the annual data by PCA analysis	62
TABLE 2	Correlation coefficients between offenses and the first four principal components for the annual data (1982-1997).....	63
TABLE 3	Proportions of the variance explained by each of the first four principal components and communalities for the annual data	65
TABLE 4	Component Score Coefficient Matrix for the annual data	66
TABLE 5	Variance explained by the five most important components of the monthly data by PCA analysis	68
TABLE 6	Correlation coefficients between offenses and the first five principal components for the monthly data (1988-1997)	69
TABLE 7	Proportions of the variance explained by each of the first five principal components and communalities for the monthly data.....	70
TABLE 8	Component Score Coefficient Matrix for the monthly data	72

LIST OF FIGURES

Figure 1	Annual counts of commonly dangerous crimes for the period 1982-1997	40
Figure 2	Annual counts of offenses against life for the period 1982-1997	41
Figure 3	counts of physical injuries for the period 1982-1997	41
Figure 4	Annual counts of property crimes for the period 1982-1997.....	41
Figure 5	Annual counts of beggary and vagrancy for the period 1982-1997.	42
Figure 6	Annual counts of illegal possession and usage of fire guns for the period 1982-1997.....	43
Figure 7	Annual counts of illegal possession of explosives for the period 1982-1997.....	43
Figure 8	Annual counts of offenses concerning antiquities for the period 1982-1997.....	44
Figure 9	Annual counts of drug offenses for the period 1982-1997.....	44
Figure 10	Annual counts of smuggling for the period 1982-1997.....	45
Figure 11	Annual counts of arsons for the period 1982-1997.....	46
Figure 12	Annual counts of arsons in forests for the period 1982-1997.....	46
Figure 13	Annual counts of murder for the period 1982-1997.....	47
Figure 14	Annual counts of homicide by misadventure for the period 1982-1997.	47
Figure 15	Annual counts of caused deaths by car for the period 1982-1997.	48
Figure 16	Annual counts of physical injury by car for the period 1982-1997.	48
Figure 17	Annual counts of simple, unprovoked and dangerous physical injuries for the period 1982-1997.	49
Figure 18	Annual counts of physical injuries by misadventure for the period 1982-1997.....	49
Figure 19	Annual counts of cases of one taking the law into one's own hands for the period 1982-1997.....	50

Figure 20	Annual counts of larceny for the period 1982-1997.	50
Figure 21	Annual counts of robbery for the period 1982-1997.....	51
Figure 22	Annual counts of rape for the period 1988-1997.....	51
Figure 23	Monthly counts of commonly dangerous crimes for the period 1987-1997.....	52
Figure 24	Monthly counts of smuggling offenses for the period 1987- 1997	52
Figure 25	Monthly counts of arsons for the period 1987-1997	53
Figure 26	Monthly counts of arsons in forests for the period 1987-1997....	53
Figure 27	Monthly counts of homicide by misadventure for the period 1987-1997	53
Figure 28	Monthly counts of property offenses for the period 1987- 1997	54
Figure 29	Monthly counts of beggary and vagrancy for the period 1987-1997	54
Figure 30	Monthly counts of illegal possession and usage of fire guns for the period 1987-1997.....	55
Figure 31	Monthly counts of drug offenses for the period 1987-1997	55
Figure 32	Monthly counts of larceny for the period 1987-1997	56
Figure 33	Monthly counts of robbery for the period 1987-1997	56
Figure 34	Monthly counts of offenses against life for the period 1987- 1997	57
Figure 35	Monthly counts of physical injuries for the period 1987-1997 ...	57
Figure 36	Monthly counts of illegal possession and usage of explosives for the period 1987-1997.....	57
Figure 37	Monthly counts of caused deaths by car for the period 1987- 1997	58
Figure 38	Monthly counts of simple, unprovoked and dangerous physical injuries for the period 1987-1997	58
Figure 39	Monthly counts of physical injuries of a person by car for the period 1987-1997	58
Figure 40	Monthly counts of rapes for the period 1988-1997.....	59
Figure 41	Monthly counts of other simple physical injuries for the period 1987-1997.....	59

Figure 42	Monthly counts of cases that one took the law into one's hand for the period 1987-1997	60
Figure 43	Monthly counts of offenses concerning antiquities for the period 1987-1997.....	60
Figure 44	Monthly counts of murders for the period 1987-1997	61
Figure 45	Scree plot of the PCA analysis of the annual data.....	62
Figure 46	Scatter plot of component scores for the first two principal components of the annual data	67
Figure 47	Scree plot of the PCA analysis of the monthly data	68
Figure 48	Scatter plot of component scores for the first two principal components of the monthly data.....	73
Figure 49	Scree plot of the clustering criterion for the annual data using Complete Linkage method	74
Figure 50	Dendrogram of the annual data using Complete Linkage method	75
Figure 51	Scree plot of the clustering criterion for the annual data using Centroid method.....	75
Figure 52	Dendrogram of the annual data using Centroid method.....	76
Figure 53	Scree plot of the clustering criterion for the annual data using Ward's method	76
Figure 54	Dendrogram of the annual data using Ward's method.	77
Figure 55	Scree plot of the clustering criterion for the monthly data using Ward's method	78
Figure 56	Dendrogram of the monthly data using Ward's method.....	78
Figure 57	Mapping of Greek counties clustering according to offenses concerning antiquities for the year 1997.....	90
Figure 58	Dendrogram of 'Taking the law into one's hands' using Complete Linkage.....	93
Figure 59	Mapping of Greek counties according to 'taking the law into one's hands'.	93
Figure 60	Dendrogram of 'Arsons' using Complete Linkage.	94
Figure 61	Mapping of Greek counties according to 'Arsons'.....	95
Figure 62	Dendrogram of 'Offenses concerning antiquities' using Complete Linkage.....	96

Figure 63	Mapping of Greek counties according to ‘Offenses concerning antiquities’.....	97
Figure 64	Dendrogram of ‘Caused deaths by car’ using Complete Linkage.	98
Figure 65	Mapping of Greek counties according to ‘Caused deaths by car’.....	99
Figure 66	Dendrogram of ‘commonly Dangerous Crimes’ using Complete Linkage.....	100
Figure 67	Mapping of Greek counties according to ‘Commonly dangerous crimes’.....	100
Figure 68	Dendrogram of ‘Drugs offenses’ using Complete Linkage.	101
Figure 69	Mapping of Greek counties according to ‘Drugs offenses’.....	102
Figure 70	Dendrogram of ‘Beggary and Vagrancy’ using Complete Linkage.	103
Figure 71	Mapping of Greek counties according to ‘Beggary and Vagrancy’.....	104
Figure 72	Dendrogram of ‘Offenses concerning explosives’ using complete Linkage.	105
Figure 73	Mapping of Greek counties according to ‘Offenses concerning explosives’.	105
Figure 74	Dendrogram of ‘Arsons in forests’ using Complete Linkage. ...	106
Figure 75	Dendrogram of ‘Arsons in forests’ using Complete Linkage, excluding Xios.....	107
Figure 76	Mapping of Greek counties according to ‘Arsons in forests’....	108
Figure 77	Dendrogram of ‘Illegal possession and usage of fire guns’ using Complete Linkage.	109
Figure 78	Mapping of Greek counties according to ‘Illegal possession and usage of fire guns’.....	109
Figure 79	Dendrogram of ‘Homicides by misadventure’ using Complete Linkage.....	110
Figure 80	Mapping of Greek counties according to ‘Homicides by misadventure’.....	111
Figure 81	Dendrogram of ‘Smuggling’ using Complete Linkage.	112
Figure 82	Mapping of the Greek counties according to ‘Smuggling’.....	112

Figure 83	Dendrogram of ‘Offenses against life’ using Complete Linkage.	113
Figure 84	Mapping of Greek counties according to ‘Offenses against life’.	114
Figure 85	Dendrogram of ‘Robbery’ using complete Linkage.	115
Figure 86	Mapping of Greek counties according to ‘Robbery’.	116
Figure 87	Dendrogram of ‘Murder’ using Complete Linkage.	117
Figure 88	Mapping of Greek counties according to ‘Murder’.	118
Figure 89	Dendrogram of ‘Rape’ using Complete Linkage.	119
Figure 90	Mapping of Greek counties according to ‘Rape’.	119
Figure 91	Dendrogram of ‘Physical Injuries’ using Complete Linkage. ...	121
Figure 92	Mapping of Greek counties according to ‘Physical Injuries’. ...	121
Figure 93	Dendrogram of 1987 using Complete Linkage.	123
Figure 94	Mapping of Greek counties according to crime volume of 1987.	124
Figure 95	Dendrogram of 1988 using Complete Linkage.	125
Figure 96	Mapping of Greek counties according to crime volume of 1988.	126
Figure 97	Dendrogram of 1989 using Complete Linkage.	127
Figure 98	Mapping of Greek counties according to crime volume of 1989.	127
Figure 99	Dendrogram of 1990 using Complete Linkage.	128
Figure 100	Mapping of Greek counties according to crime volume of 1990.	129
Figure 101	Dendrogram of 1991 using Complete Linkage.	130
Figure 102	Mapping of Greek counties according to crime volume of 1991.	131
Figure 103	Dendrogram of 1992 using Complete Linkage.	132
Figure 104	Mapping of Greek counties according to crime volume of 1992.	132
Figure 105	Dendrogram of 1993 using Complete Linkage.	133
Figure 106	Mapping of Greek counties according to crime volume of 1993.	134
Figure 107	Dendrogram of 1994 using Complete Linkage.	135

Figure 108 Mapping of Greek counties according to crime volume of 1994.	136
Figure 109 Dendrogram of 1995 using Complete Linkage.	137
Figure 110 Mapping of Greek counties according to crime volume of 1995.	137
Figure 111 Dendrogram of 1996 using Complete Linkage.	138
Figure 112 Mapping of Greek counties according to crime volume of 1996.	139
Figure 113 Dendrogram of 1997 using Complete Linkage.	140
Figure 114 Mapping of Greek counties according to crime volume of 1997.	141
Figure 115 Dendrogram of the total volume of offenses using Complete Linkage.	142
Figure 116 Mapping of Greek counties according to crime volume of the period 1987-1997.	143